Specification

Gravure Printing Unit

The invention relates to a rotogravure printing unit in accordance with the preamble of claim 1 or 2.

A printing forme, as a rule made of copper and having engraved depressions, is attached to the shell face of the forme cylinder. These depressions are filled with ink by the inking unit. In the course of printing, a paper web is pressed against the forme cylinder by a counter-pressure cylinder and absorbs the ink in the depressions. Before the printing formed inked by the inking unit comes into contact with the paper, excess ink on the printing forme is removed by a doctor blade device, so that ink only remains in the depressions.

An inking unit for a rotogravure rotary printing press is known from EP 0 980 311 B1, and consists substantially of a doctor blade device, an ink trough and a catch basin. The ink trough, as well as the catch basin, of this inking unit can be adjusted in height.

An inking unit for a rotogravure rotary printing press is also known from EP 0 655 328 B1, which has an ink trough for receiving ink, an inking roller and a doctor blade device acting on the shell face of the forme cylinder. The ink trough of this inking unit is arranged underneath the forme cylinder, which dips into the ink. The width of the ink trough is furthermore less than the width of the forme cylinder.

Lately, paper webs of greater width are increasingly processed. Longer forme cylinders of widths between 1.5 m to 4.5 m are required for this. In conventional inking units, such wide forme cylinders are inked by means of appropriately wide inking rollers. However, at such widths the forme cylinders, as well as the inking rollers, have an increased tendency to sag. In this case they sag the more, the less their diameter is. In connection with conventional rotogravure rotary printing presses for processing paper webs of great width it therefore occurs, that ink fluctuations up to the complete loss of ink appear in the finished product, because the inking roller rests unevenly against the forme cylinder and the latter is therefore inked in different degrees in different areas.

Even gaps can occur between the inking roller and the forme cylinder, so that portions of the printing form supported by the forme cylinder are not inked at all. For example, such a gap between the two cylinders occurs in a center area of the width if the forme cylinder has a large diameter and the inking roller a small diameter, so that the inking roller sags more in the center than the forme cylinder. But in connection with a thin forme cylinder, it can happen that it sags more than the inking roller, so that a gap between the forme cylinder and the inking roller is created in the edge areas and the printing forme is not inked there.

DE 42 38 054 C2 discloses an inking unit for a rotogravure forme cylinder with a single continuous inking roller and an additional shorter support roller.

CH 012 232, USP 1,259,394 and DE 17 58 214 U show inking rollers which are divided in the axial direction. These divisions are arranged on a common shaft.

The object of the invention is based on creating a rotogravure printing unit.

The object is attained in accordance with the invention by means of the characteristics of claim 1 or 2.

The advantages which can be achieved by means of the invention reside in particular in that such an inking unit allows even inking, even of wide forme cylinders, because several inking rollers are provided, because of which individual inking rollers can be employed for inking problematical areas of the forme cylinder. There, a single inking roller need not extend over the entire width of the surface of the forme cylinder to be inked. Instead, its width will preferably be limited to a surface area of the forme cylinder which can be inked without problems, and adjoining surface areas will each be assigned their own inking roller. With such an inking unit the short inking rollers can all be brought into contact with the forme cylinder over their entire width.

The inking rollers can be arranged staggered in the inking unit. Staggering of the inking rollers can take place over the width, as well as a length of the trough.

In this case preferably at least two inking rollers are arranged along the same shaft.

The inking unit can be embodied in such a way that two areas of width along which an inking roller extends overlap.

In a particularly preferred manner the inking rollers dip at least partially into the ink. In this case the inking rollers can transfer ink from the trough directly to the forme cylinder without interposed roller systems needing to be provided.

Also particularly preferred, the inking rollers can be separately height-adjusted within the trough. This permits the individual adjustment of the inking rollers to sagging of the forme cylinder and to let them all act against the forme cylinder with the same contact force, so that a uniform inking of the printing forme results.

For assuring the ink transfer to the printing forme, and particularly into the depressions of the printing forme, the inking rollers are preferably provided with a terrycloth-like or a visco-elastic covering.

The printing unit has several inking rollers, which can be placed against different parts of the width of a forme cylinder.

Preferably the inking rollers are a part of an inking unit as described above. However, it would also be conceivable to assign each inking roller its own ink trough.

Exemplary embodiments of the invention are represented in the drawings and will be described in greater detail in what follows.

Shown are in:

Fig. 1, a cross section through a printing unit of a known rotogravure rotary printing press,

Fig. 2, a front view of a known printing unit with a forme cylinder of a large diameter,

Fig. 3, a front view of a known printing unit with a forme cylinder of a small diameter,

Fig. 4, a first embodiment of an inking unit,

Fig. 5, a second embodiment of an inking unit,

Fig. 6, a third embodiment of an inking unit,

Fig. 7, a cross section through a printing unit of a rotorgravure rotary printing press with an inking unit,

Fig. 8, a front view of a portion of a printing unit with an inking unit and a forme cylinder of a large diameter,

Fig. 9, a front view of a portion of a printing unit with an inking unit and a forme cylinder of a small diameter.

A cross section through a known rotogravure printing unit 01 of a rotogravure rotary printing press can be seen in Fig. 1. It consists of an inking unit 02, a cylinder 06, for example a forme cylinder 06, a cylinder 07, for example a counter-pressure cylinder 07, a doctor blade 08, as well as guide cylinders 11. The forme cylinder 06 has a printing forme on its shell face, which has engraved depressions. It is rotatably seated in a frame, not represented. The inking unit 02 has been placed against the forme cylinder 06 from below. The doctor blade 08 has been placed against the forme cylinder 06 from the side. The counter-pressure cylinder 07 presses from above against the forme cylinder 06, and together with it delimits a printing gap. A web 09 of material to be imprinted by the printing unit 01, for example paper web 09, is conducted through this printing gap. Prior to entering the printing gap or after leaving the printing gap, the paper web 09 respectively loops around one of the guide cylinders 11.

The inking unit 02 is comprised of a trough 03 and an inking roller 04. A liquid or pasty ink has been introduced into the trough 03. The inking roller 04 is rotatably

seated inside the trough 03 and partially dips into the ink. It is provided with a fibrous terrycloth-like or visco-elastic covering on its surface. The inking unit 02 as a whole can be displaced in height relative to the forme cylinder 06. In the position of the inking unit 02 represented in Fig. 1, the inking roller 04 has been placed against the forme cylinder 06.

The forme cylinder 06 is rotating during the operation of the printing unit 01. Because of its positive contact with the inking roller 04, the latter can also be rotatingly taken along by the forme cylinder 06. However, the inking roller 04 can also be rotatingly driven independently of the forme cylinder 06 at a circumferential speed which differs from the circumferential speed of the forme cylinder 06 in order to distribute the ink on its surface. Because the inking roller 04 dips into the ink received in the trough 03, as a result of its rotating movement the inking roller 04 transfers this ink to the surface of the forme cylinder 06, more correctly to the printing forme applied to the shell face of the forme cylinder 06. This effect is furthered by the particularly absorbing cover of the inking roller 04. Based on the fibrous or elastic embodiment of the latter it is possible to introduce the ink into the depressions of the printing forme in particular.

In the further course of the rotation of the forme cylinder 06, excess ink remaining on the printing forme, which has not reached the depressions, is removed by the doctor blade 08, so that only the ink in the depressions is left. This ink is absorbed by the paper web 09, which is

pressed against the forme cylinder 06 by the counter-pressure cylinder 07, on its way through the printing gap.

Figs. 2 and 3 illustrate the problems which are created if wide forme cylinders 06 are used in known printing units 01 of the type described when it is intended to imprint a paper web 09 of 150 cm width or more.

Fig. 2 shows the situation in connection with a printing unit 01 with a forme cylinder 06 of large diameter. A front view of a portion of the printing unit 01 can be seen in Fig. 2, namely the forme cylinder 06 with the inking roller 06 of the inking unit 02 placed against it. Only the ends of the counter-pressure cylinder 07 are visible, since it is covered to a large extent by the paper web 09 entering the printing gap formed by the counter-pressure cylinder 07 and the forme cylinder 06.

As Fig. 2 shows, the inking roller 04 sags downward. Although this is also the case with the forme cylinder 06, its sagging is substantially less than that of the inking roller 04, because it has a substantially larger diameter, and therefore greater rigidity. As a result of the sagging of the inking roller 04, a gap S between the inking roller 04 and the forme cylinder 06 is formed in the center of the inking roller 04. The inking roller 04 does not come into contact with the forme cylinder 06 in the area of the gap S. As a result of this, in this area there is also no inking of the printing forme applied to the forme cylinder 06. Un-inked spots in the finished product are the result.

Fig. 3 shows a similar situation of a printing unit 01 with a forme cylinder 06, which has a small diameter. Based

on its inherent weight, and because of the counter-pressure cylinder 07 pushing against it, the forme cylinder 06 sags substantially more than the inking roller 04. In this case gaps S are created between the inking roller 04 and the forme cylinder 06 in their edge areas, while the inking roller 04 is in contact with the forme cylinder 06 at the center. In the case represented in Fig. 3 the edge areas of the printing forme applied to the forme cylinder 06 are not being inked, so that in this case un-inked spots result in the finished product in these areas.

An inking unit 02, in which such gaps S can be prevented when it is used in a printing unit 01, is shown in Fig. 4.

Fig. 4 is a view from above on such an inking unit 02. It shows a trough 03, as well as three inking rollers 12, 13, 14, which are rotatably seated inside the trough 03. Each one of the inking rollers 12, 13, 14 extends over only a limited portion of the width of the trough 03. In this case the inking rollers 12, 13, 14 are arranged staggered along the width of the trough 03, as well as along the length of the trough 03. The staggering of the inking rollers 12, 13, 14 along the width of the trough 03 is such that it takes place from the left to the right with increasing reference numerals, while staggering along the length of the trough 03 is such that the inking rollers 12 and 14 are arranged on and are rotatable around one shaft, which is offset parallel in relation to a shaft around which the inking roller 13 rotates.

All three inking rollers 12, 13, 14 are arranged inside the trough 03 in such a way that the respective sections of

width, along which respectively one of the inking rollers 12, 13 or 14 extends, touch each other free of overlap on the dashed-drawn lines. In an alternative embodiment of the inking unit 02 said sections of width can also overlap each other.

An area of the rotogravure forme cylinder 06 inked by means of the first inking roller 13, and at least two of the areas of the rotogravure forme cylinder inked by the at least two other inking rollers 12, 14 overlap in this embodiment in the axial direction (Fig. 6).

Each one of the at least three inking rollers 12, 13, 14 is preferably shorter than the barrel of the rotogravure forme cylinder 06.

A length of the barrels L12, L13, L14 of each one of the inking rollers 12, 13, 14 is for example shorter than 1.1-times the length L06 of the barrel of the rotogravure forme cylinder 06 divided by the number N of the inking rollers 12, 13, 14 in the axial direction, i.e., for example,

$$L12,\ L13,\ L14 = \frac{1.1 \times L06}{N}$$

wherein N = a whole number larger than/equal to (≥) 3.

Another embodiment of an inking unit is represented in Fig. 5. Here, too, the inking unit 02 is represented in a view from above. Three inking rollers 12, 13, 14 can again be seen and are rotatably arranged inside a trough 03. In contrast to the previously represented case, in the embodiment shown the inking rollers 12, 13, 14 are all three arranged along the same shaft. Now the areas of width along

which the inking rollers 12, 13, 14 extend, are spaced apart from each other.

Such an inking unit is well suited for printing several pages side-by-side on the paper web 09. These pages are always separated from each other by a zone without printing. If the width and number of the inking rollers 12, 13, 14 are selected to correspond to the width and number of pages to be printed side-by-side, the areas of the forme cylinder 06 which are not inked coincide with the non-printed zones of the paper web 09.

Fig. 7 shows the action of the inking unit 02 represented in Fig. 4 in a printing unit 01, in which a cross section through such a printing unit 01 with the inking unit from Fig. 4 is shown. Holding means 16 can be distinguished in this cross section, by means of which the inking rollers 12, 13, 14 are held inside the trough 03. The inking rollers 12, 13, 14 can be adjusted in height within the trough 03. All three inking rollers 12, 13, 14 rest directly against the forme cylinder 06. It is possible by means of the holding means 16 to individually set a contact force, with which the inking rollers 12, 13, 14 press against the forme cylinder 06. The inking rollers 12, 13, 14 can be matched to the bending of the forme cylinder 06 in this way. This is represented in Fig. 8, in which the parts of the printing unit 01 represented in Fig. 7 can be seen in a front view. Now all three inking rollers 12, 13, 14 rest flush against the forme cylinder 06 because of the individual adjustment of the contact force of each inking roller 12, 13, 14. No gap S appears between the forme cylinder 06 and one of the inking rollers 12, 13, 14 at any point along the width of the forme

cylinder 06. Thus the printing forme applied to the shell face of the forme cylinder 06 is evenly inked over the entire width of the forme cylinder 06.

This has been correspondingly shown in Fig. 9 for the case of a forme cylinder 06 of a lesser diameter. Here, too, the inking rollers 12, 13, 14 rest flush against the forme cylinder 06. Now, no gaps S appear between the forme cylinder 06 and the inking rollers 12 and 14 in the edge areas of the forme cylinder 06, since in these areas the inking rollers 12 and 14 are pressed against the forme cylinder 06 with the same contact pressure as the inking roller 13 in that they are appropriately height-adjusted inside the trough 03.

List of Reference Symbols

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| 01 | Rotogravure printing unit |
| 02 | Inking unit |
| 03 | Trough |
| 04 | Inking roller |
| 05 | - |
| 06 | Cylinder, forme cylinder |
| 07 | Cylinder, counter-pressure cylinder |
| 08 | Doctor blade |
| 09 | Web of material, paper web |
| 10 | - |
| 11 | Guide cylinder |
| 12 | Inking roller |
| 13 | Inking roller |
| 14 | Inking roller |
| 15 | - |
| 16 | Holding means |
| S | Gap |
| L06 | Barrel length (06) |
| L12 | Barrel length (12) |
| L13 | Barrel length (13) |
| L14 | Barrel length (14) |